

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-5. (Canceled)

6. (Previously presented) An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

audio encoding means that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames, a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection

point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

 multiplexing means that multiplexes the audio data and the video data to generate the video object;

 control means that controls the multiplexing means so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and generates a flag indicative of an audio multiplex state at the time of multiplexing by the multiplexing means; and

 recording means that records the video object output from the multiplexing means controlled by the control means onto the recording medium together with a flag indicative of the audio multiplex state generated by the control means.

7. (Previously presented) An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

audio encoding means that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames, a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

multiplexing means that multiplexes the audio data and the video data to generate the video object;

control means that controls the multiplexing means so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and generates a flag indicative of an audio multiplex state at the time of multiplexing by the multiplexing means;

first recording means that records the video object output from the multiplexing means controlled by the control means onto the recording medium together with a flag indicative of the audio multiplex state generated by the control means; and

second recording means that records the edition point in the audio frame as registration information onto the recording medium.

8. (Previously presented) An audio/video recording method of, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

a second step of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

a third step of determining an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames, a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and

the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

a fourth step of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data; and

a fifth step of recording a flag indicative of an audio multiplex state under control of the fourth step onto the recording medium together with the video object obtained by multiplexing under the control of the fourth step.

9. (Previously presented) An audio/video recording method of, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

a second step of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

a third step of determining an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames, a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

a fourth step of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data;

a fifth step of recording a flag indicative of an audio multiplex state under control in the fourth step onto the recording medium together with the video object obtained by multiplexing under control of the fourth step; and

a sixth step of recording the edition point in the audio frame as management information onto the recording medium.

10. (Previously presented) An audio/video reproducing apparatus for reproducing video data and audio data on the basis of reproduction management information from a recording medium on which a video object and management information including an edition point in an audio frame and a flag indicative of an audio multiplex state are recorded by a recording apparatus according to claim 7, comprising:

overlap time calculating means that calculates time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object with respect to an edition point in the reproduction management information;

offset time calculating means that sets the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection point in a designated reproduction sequence, calculates a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

resetting means that resets a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

offset means that offsets PTS of an audio frame reproduced from the recording medium in accordance with the calculated audio PTS offset time;

video data reproducing means that reproduces video data reproduced from the recording medium in accordance with video PTS accompanying the video data;

audio frame reproducing means that reproduces an audio frame reproduced from the recording medium in accordance with the offset PTS and, when the audio drop flag shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced by the audio frame reproducing means and outputs an audio signal.

11. (Previously presented) The audio/video reproducing apparatus according to claim 10, wherein when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio frame time, the offset time calculating means calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time, and outputs an audio drop flag of

a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection.

12. (Previously presented) An audio/video reproducing method for reproducing video data and audio data on the basis of reproduction management information from a recording medium on which a video object and management information including an edition point in an audio frame and a flag indicative of an audio multiplex state are recorded by a recording method according to claim 9, comprising:

a first step of calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object with respect to an edition point in the reproduction management information;

a second step of setting the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection point in a designated reproduction sequence, calculating a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

a third step of resetting a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a fourth step of offsetting PTS of an audio frame reproduced from the recording medium in accordance with the audio PTS offset time calculated in the second step;

a fifth step of reproducing video data that is reproduced from the recording medium in accordance with video PTS accompanying the video data;

a sixth step of reproducing an audio frame that is reproduced from the recording medium in accordance with the PTS which is offset in the fourth step and, when the audio drop flag that is output in the third step shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a seventh step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step and outputting an audio signal.

13. (Previously presented) The audio/video reproducing method according to claim 12, wherein in the second step, when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio frame time, a value obtained by subtracting the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating

that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection is output.

14. (Canceled)

15. (Previously presented) An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

audio encoding means that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames, a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of

reproducing an audio frame in the following video object partly overlap each other around the connection point;

 multiplexing means that multiplexes the audio data and the video data to generate the video object;

 control means that controls the multiplexing means so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and generates a flag indicative of an audio multiplex state at the time of multiplexing by the multiplexing means;

 overlap time calculating means for calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time; and

 recording means that records the video object output from the multiplexing means controlled by the control means onto the recording medium together with a flag indicative of the audio multiplex state generated by the control means, and records at least the overlap time as management information onto the recording medium.

16. (Previously presented) An audio/video recording method of, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

a second step of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

a third step of determining an edition point in an audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

a fourth step of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data;

a fifth step of calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time; and

a sixth step of recording a flag indicative of an audio multiplex state under control of the fourth step onto the recording medium together with the video object obtained by

multiplexing under the control of the fourth step, and recording at least the overlap time as management information onto the recording medium.

17. (Previously presented) An audio/video reproducing apparatus for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium on which a video object and the reproduction sequence are recorded by a recording apparatus according to claim 15, comprising:

overlap time reproducing means that reproduces the overlap time from the recording medium;

offset time calculating means that sets the overlap time reproduced from the recording medium as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the connection point is the first connection point in the reproduction sequence, calculates a value obtained by adding the overlap time reproduced from the recording medium and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the connection point is any of the second and subsequent connection points in the reproduction sequence, and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

resetting means that resets a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

offset means that offsets PTS of an audio frame reproduced from the recording medium in accordance with the calculated audio PTS offset time;

video data reproducing means that reproduces video data reproduced from the recording medium in accordance with video PTS accompanying the video data;

audio frame reproducing means that reproduces an audio frame reproduced from the recording medium in accordance with the offset PTS and, when the audio drop flag shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced by the audio frame reproducing means and outputs an audio signal.

18. (Previously presented) The audio/video reproducing apparatus according to claim 17, wherein when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio frame time, the offset time calculating means calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time, and outputs an audio drop flag of

a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection.

19. (Previously presented) An audio/video reproducing method for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium on which a video object and a reproduction sequence are recorded by a recording method according to claim 16, comprising:

- a first step of reproducing the overlap time from the recording medium;

- a second step of setting the overlap time reproduced from the recording medium as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the connection point is the first connection point in the reproduction sequence, calculating a value obtained by adding the overlap time reproduced from the recording medium and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the connection point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

- a third step of resetting a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a fourth step of offsetting PTS of an audio frame reproduced from the recording medium in accordance with the audio PTS offset time calculated in the second step;

a fifth step of reproducing video data that is reproduced from the recording medium in accordance with video PTS accompanying the video data;

a sixth step of reproducing an audio frame that is reproduced from the recording medium in accordance with the PTS which is offset in the fourth step and, when the audio drop flag that is output in the third step shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a seventh step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step and outputting an audio signal.

20. (Previously presented) The audio/video reproducing method according to claim 19, wherein in the second step, when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio frame time, a value obtained by subtracting the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection is output.

21. (Canceled)

22. (Previously presented) An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

audio encoding means that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

multiplexing means that multiplexes the audio data and the video data to generate the video object;

control means that controls the multiplexing means so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and generates a flag indicative of an audio multiplex state at the time of multiplexing by the multiplexing means;

overlap time calculating means for calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time;

offset time calculating means for, when the connection point is the first connection point in the reproduction sequence, setting the overlap time as audio PTS offset time used at the time of reproducing an audio frame in the video object and, when the connection point is any of the second and subsequent connection points in the reproduction sequence, calculating a value obtained by adding the overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present connection point; and

recording means that records the video object output from the multiplexing means controlled by the control means onto the recording medium together with a flag indicative of the audio multiplex state generated by the control means, and records at least the overlap time and the audio PTS offset time as management information onto the recording medium.

23. (Previously presented) The audio/video recording apparatus according to claim 22, wherein when the audio PTS offset time at the calculated connection point is longer than a

period of "n" times (where n is 1 or 1/2) of an audio frame period, the offset time calculating means calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection, and the recording means records the audio PTS offset time and the audio drop flag as the management information onto the recording medium.

24. (Previously presented) An audio/video recording method for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium, recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

- a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

- a second step of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

- a third step of determining an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the

connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point, and the period of reproducing an audio frame in the video object and the period of reproducing an audio frame in the following video object partly overlap each other around the connection point;

a fourth step of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data;

a fifth step of calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time;

a sixth step of, when the connection point is the first connection point in the reproduction sequence, setting the overlap time as audio PTS offset time used at the time of reproducing an audio frame in the video object and, when the connection point is any of the second and subsequent connection points in the reproduction sequence, calculating a value obtained by adding the overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present connection point; and

a seventh step of recording a flag indicative of an audio multiplex state under control of the fourth step onto the recording medium together with the video object obtained by multiplexing under the control of the fourth step, and recording at least the overlap time and the audio PTS offset time as management information onto the recording medium.

25. (Previously presented) An audio/video recording method according to claim 24, wherein in the fifth step, when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of an audio frame period, a value obtained by subtracting the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection is output and, in the sixth step, the audio PTS offset time and the audio drop flag are recorded as the management information onto the recording medium.

26. (Previously presented) An audio/video reproducing apparatus for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium on which a video object and the reproduction sequence is recorded by a recording apparatus according to claim 22 or 23, comprising:

resetting means that resets a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

offset means that offsets PTS of an audio frame reproduced from the recording medium in accordance with the audio PTS offset time which is reproduced from the recording medium;

video data reproducing means that reproduces video data reproduced from the recording medium in accordance with video PTS accompanying the video data;

audio data reproducing means that reproduces audio data reproduced from the recording medium in accordance with the offset PTS;

drop processing means that, when the audio drop flag reproduced from the recording medium shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced by the audio data reproducing means and outputs an audio signal.

27. (Currently amended) An audio/video reproducing method for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium on which a video object and the reproduction sequence is recorded by a recording method according to claim 24 or [[.]] 25, comprising:

a first step of resetting a system time clock of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a second step of offsetting PTS of an audio frame reproduced from the recording medium in accordance with the audio PTS offset time which is reproduced from the recording medium;

a third step of reproducing video data reproduced from the recording medium in accordance with video PTS accompanying the video data;

a fourth step of reproducing audio data reproduced from the recording medium in accordance with the offset PTS;

a fifth step of, when the audio drop flag reproduced from the recording medium shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a sixth step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced in the fourth step.

28-29. (Canceled)